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SUSCEPTIBILITY OF KENTUCKY BLUEGRASS CULTIVARS AND SELECTIONS TO INFESTATIONS OF AND INJURY BY THE BLUEGRASS BILLBUG (COLEOPTERA: CURCULIONIDAE)

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Abstract.—Nine cultivars and selections of the Kentucky bluegrass, *Poa pratensis* L., were examined for susceptibility to a natural infestation of the larvae of the bluegrass billbug, *Sphenophorus parvulus* Gyllenhal. There was a significant correlation ($r = 0.767$, $df = 7$, $P < 0.05$) between larval infestations and percent damage to the bluegrasses. 'Kenblue' was among the least damaged entries and had minimal infestation. This established cultivar is characterized by narrow leaves, an upright (taller) posture, and high susceptibility to the leaf spot and melting-out disease incited by *Drechslera poae* (Baudys) Shoem. The other cultivars and selections had broader leaves, lower growth, and showed less disease damage. Possibly, these characteristics render these other bluegrasses more apparent than Kenblue and, thereby, are preferred over Kenblue for oviposition by the adult billbugs.

Introduction

The bluegrass billbug, *Sphenophorus parvulus* Gyllenhal, often causes damage to Kentucky bluegrass, *Poa pratensis* L., which is widely used as a turf and pasture grass in the northcentral and northeastern U.S. The damage caused by this pest is particularly severe in Nebraska (Kindler and Kinbacher 1975). In 1978, a natural infestation of bluegrass billbugs in the turfgrass plots at the N.J. Agric. Exp. Stn. Res. Ctr. at Adelphia, N.J., provided an opportunity to assess the relative susceptibility of 9 Kentucky bluegrass cultivars and selections. The data provided a partial test for the earlier observations of Kindler and Kinbacher (1975), and 1979 observations of Lindgren et al. (1981) that suggested differential reaction of Kentucky bluegrass cultivars to the bluegrass billbug.

Methods

The various cultivars and experimental selections of Kentucky bluegrass were seeded in a replicated test at Adelphia, during September 1974. The test site was on a loamy sand. Plot size was 1.22 × 1.83 m with a 0.15 m unplanted border between each plot. The grass was mowed at 3.8 cm during the fall of establishment but lowered to 1.9 cm thereafter. Weeds were controlled, as needed, with DCPA, dicamba, and 2,4-D. Soil was limed to maintain a pH of 6.0. The test was irrigated as needed for rapid establishment, and later, to prevent severe drought stress. Two nitrogen fertilizer levels (1.7 and 3.2 kg/92.94 m^2) were established on each plot during the 1974–78 period. The fertility level appeared to have little, if any, effect on bluegrass damage.

During the 2nd week of July 1978, there was evidence of differential damage to the various cultivar plots, and an initial observation showed that the damage to the Kentucky bluegrass was primarily due to the larvae of the bluegrass billbug. Populations of other coleopterous pests such as the Japanese beetle, *Popillia japonica* Newman, northern masked chafer *Cyclocephala borealis* Arrow, European chafer *Rhizotrogus majalis* (Razoumowsky), and black turfgrass ataenius *Ataenius spretulus* (Hald.) that are also serious pests of turfgrasses in northeastern region (Tashiro 1973), were not present in the turfgrass plots at levels that would cause significant damage. During the 3rd week of July, the plots were examined for billbug infestations and extent of injury.

The infestations were quantified by two separate determinations, each with two replicates, and each sample covering 0.09 m^2 of turfgrass in each cultivar plot. The larvae were examined and counted by laying back the sod with sharp knife and removing and examining the sod and soil to a depth of 4 cm. The damage to cultivars was visually assessed twice on the basis of percent damage (0, 10, 20, . . . , 100); the observations were repeated 2 more times, providing 6 determinations for each cultivar and selection. Each observation of injury was carried out by a different observer to minimize potential error inherent in this procedure if left entirely to the judgement of a single individual.

The data on larval counts (4 determinations), and percent injury to cultivars (6 determinations) were pooled to obtain mean values and for statistical analysis to establish significant differences among the sample means. The data also were analyzed for correlation between larval counts and damage to bluegrass cultivars and selections.

Results and Discussion

Table 1 presents data on damage to Kentucky bluegrass cultivars and selections and mean numbers (per 0.09 m^2) of billbug larvae responsible for the damage. The counts of billbug larvae ranged from a low of 1.3/0.09 m^2 for 'Kenblue' to a high of 60.3/0.09 m^2, for 'Nugget.' Low damage, ca. 25 to 27%, was recorded on Kenblue, 'F 1757,' and 'F 353.' The entries showing high damage, over 80%, were Nugget, 'Cheri,' and 'K3-182.'

A significant correlation coefficient ($r = 0.767$, df = 7, $P < 0.05$) was found between the larval counts and the damage to the bluegrasses. Since one selection, K3-182, was exceptional in that despite low larval counts (18.5/0.09 m^2) it was most severely damaged (87%), it was of interest to

Table 1. Susceptibility of Kentucky bluegrass cultivars to damage by the bluegrass billbug in turfgrass trials during September 1978 at Adelphia, N.J.

Bluegrass cultivar or selection	$\bar{x}$ percent turfgrass damage[1]	$\bar{x}$ number of billbug larvae per 0.09 m^2 [2]
Kenblue	27.4 a	1.3 a
F 1757	24.7 a	12.3 b
F 353	26.7 a	13.0 b
Princeton 104	39.1 a	14.8 b
Baron	67.8 b	51.0 c
Merion	76.0 b	57.8 c
Nugget	82.4 b	60.3 c
Cheri	83.5 b	45.3 c
K3-182	87.0 b	18.5 b

[1] Assessment based on 3 separate observations, each with 2 replicates; N = 6. Means not followed by the same letter are significantly different at 5% level by Duncan's multiple range test.

[2] Based on 2 separate observations, each with 2 replicates; N = 4. Area of each sample (replicate) = 0.09 m^2. Means not followed by the same letter are significantly different at 5% level by Duncan's multiple range test.

evaluate the correlation coefficient by deleting this selection from data analysis. Analyzed in this way the correlation coefficient was even more highly significant (r = 0.950, df = 6, $P < 0.01$). Although we have no explanation to account for the extensive damage of K3-182, inasmuch as the data analysis with or without inclusion of this cultivar provided a significant correlation coefficient, the observations of Kindler and Kinbacher (1975) and Lindgren et al. (1981) were reaffirmed. Moreover, in the study of the differential reaction of Kentucky bluegrass cultivars to the bluegrass billbug by Kindler and Kinbacher (1975), the relationship was established with 15 cultivars; we had 9 entries in the present study, with 'Merion' and Nugget being common to both studies. Lindgren et al. (1981) in their 1979 study had included 38 cultivars, only 3 cultivars, Merion, Nugget, and 'Baron' being common to the present study.

The cause(s) for the differential larval density and susceptibility of the Kentucky bluegrass cultivars to the billbugs is a matter of speculation at this time. Of all the entries in the test, Kenblue is an established cultivar characterized as upright (taller) and narrow-leafed. Moreover, this variety is highly susceptible to leaf spot and melting-out disease (caused by *Drechslera poae*). The main purpose of the other entries, was to select Kentucky bluegrass for resistance to this disease. This selection however generally resulted in broader leaves and lower growth, relative to Kenblue. It may well be that these qualities render these selections more apparent and, also, as more suitable substrates for oviposition by the adult bluegrass billbugs.

More research is clearly necessary to determine the nature of resistance and the underlying mechanisms. Potentially this kind of information would be valuable for developing improved billbug resistant cultivars.

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